

App. No.: 10/743,856
Reply to Office Action of April 8, 2005
Response filed on May 6, 2005

Amendments to the Specification

Please replace specific paragraphs of the specification with the paragraphs set out below.

[0036] In particular, suitable non-Group I Fischer-Tropsch promoters for a cobalt catalyst include, but are not limited to, rhenium, ruthenium, platinum, palladium, boron, silver, and combinations thereof.

[0050] Treating the precipitate may include mixing a binder with the slurry. The binder may be in the form of a precursor compound of the binder. When the binder is silica, the binder precursor compound is preferably silicic acid. Alternatively, or in combination, the binder may be in the form of a colloidal sol of the binder, herein termed binder sol. The sol preferably includes particles of the binder having an average size between 10 and 100 nm. In this instances, when the binder is silica, the binder sol is preferably a colloidal silica sol. When the treating step includes adding a binder precursor compound and a binder sol to the precipitate, the amounts of binder precursor compound and binder sol are preferably selected such that the catalyst includes 5-15 wt. % binder derived from the binder precursor compound and 10-40 wt % binder derived from the binder sol. Two particularly preferred embodiments include using about 10 wt. % binder derived from the binder precursor compound with about 23-27 wt.%, and more particularly 24-26 wt.%, binder derived from the binder sol, or using about 10 wt.% binder derived from the binder precursor compound with about 37-40 wt.% binder derived from the binder sol.

[0076] Plug flow, fluidized bed, reactive distillation, ebulliating bed, and continuous stirred tank reactors have been delineated in "Chemical Reaction Engineering," by Octave Levenspiel, and are known in the art. A preferred slurry bubble column is described in co-pending commonly assigned U.S. Patent Application 10/193,357, and published as U.S. Patent Application No. 2003/0114543, hereby incorporated herein by reference.

[0096] Two approaches were followed to increase the wax selectivity of the precipitated bulk cobalt catalysts. In one approach, potassium was incorporated to increase the alpha of the precipitated bulk cobalt catalysts. In another approach, the binder content was increased in the catalyst. Typically, the binder used in these catalysts was silica.

App. No.: 10/743,856
Reply to Office Action of April 8, 2005
Response filed on May 6, 2005

[00107] This example describes the preparation of a catalyst with the composition of 48.8Co/2.4Zr/48.8SiO₂/0.1K. A continuous precipitator was used in preparing this catalyst. The precipitator consisted of a glass tube with an I.D. of 24 mm. A stainless steel impeller with 10 mm square blades was inserted inside this tube and rotated at about 100 rpm. The tube was heated by the means of a water jacket. A pump circulated heated water from a hot bath continuously, and the temperature was controlled at 70°C.

[00108] An aqueous solution containing Co(NO₃)₃·6H₂O (2.0 M), together with a concentration of Zr(NO₃)₃·xH₂O that corresponded to the desired Co/Zr ratio in the final catalyst, and a second solution containing sodium bicarbonate (2.0 M) were heated to 70°C before being pumped to the precipitator. The pH was measured at the top of the precipitator, and was controlled by adjusting the nitrate and/or sodium bicarbonate solution. The precipitation conditions were 70°C and a pH of 7.0. The solutions were introduced tangentially at the bottom, and the precipitate slurry overflowed at the top, from ~~where~~ where it was taken to the Buchner funnels for filtering and washing. The precipitate product was thoroughly rinsed with deionized water until the conductivity of the rinsing water was equal to or less than 50 µS.

[00109] The wet cobalt precipitate was then contacted with an acidic solution, in particular 20% HNO₃ solution, for 1 hour. After one hour, the cobalt precipitate was thoroughly washed with deionized water by vacuum filtration. The undried acid-treated Co/Zr precipitate was further mixed in a slurry with silicic acid and LUDOX® AS-40 (22 nm) colloidal silica in amounts sufficient to provide in the spray dried particles with 10% silica from the silicic acid and 38.8% silica from the colloidal silica. The slurry was spray dried and calcined in air at 550°C for 3 hours. Finally the required amount of potassium was incorporated by impregnation using a potassium bicarbonate solution. The final product was dried and calcined in air at 300°C for 2 hours.